A SURVEY OF THE NUTRIENT STATUS OF SUGARBEETS GROWN IN IDAHO AND WASHINGTON[1]

By

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INTRODUCTION

Sugarbeets are a major irrigated crop in Idaho and Washington. In recent years foliar sprays of several nutrient elements, especially the micronutrients, have been recommended by commercial consultants and applicators. As a result, many acres not only of beets but other crops as well have received foliar sprays containing one or more nutrient elements. Consequently, many questions have arisen concerning the need for such applications, especially when the crop appears to be growing well without them, and since definite responses to Cu, Fe, and Mn have not been documented and responses to Zn and B have been very few.

Painter (8) conducted eight experiments with micronutrients on sugarbeets in the Treasure Valley of Idaho and Oregon. His results indicated that neither soil applications nor foliar sprays of B, Cu, Fe, Mn, and Zn affected root yield, percent sugar, or sugar yield in any of the eight experiments. The experiments were conducted under high levels of beet root production (21 to 36 tons per acre) that would normally stress the soil's supply of nutrients. Boawn and Vietz (2) reported increased sugarbeet growth as a result of applying Zn to high pH soils in Washington. These are the only known data from controlled experiments in Idaho and Washington that relate to the need for applying micro-mutrients to sugarbeets.

Haddock and Stuart (4) conducted an extensive survey of the nutritional status of sugarbeets grown throughout the western U. S. Their survey, however, was directed towards only the highest-producing fields and was not aimed at surveying the general nutritional status of the crop. Their results show sufficient levels of Zn, Mn, Fe, Cu, and B in the leaf blades of sugarbeets from all 15 Idaho fields and 6 Washington fields included in the survey. In view of the limited available data relating to the micronutrient nutrition of sugarbeets, a survey was conducted in 1975 to determine the nutritional status of beets grown in Idaho and Washington and to delineate possible micronutrient problem areas within the two states.

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METHODS

Plant and soil samples were taken in August, 1975 from sugarbeet fields in all major beet growing areas in the two states. In Idaho, 72 samples were taken from areas along the Snake River between Idaho Falls and the Treasure Valley and extending into the Ontario-Vale, Oregon area. In Washington, 29 samples were taken from fields in the Yakima Valley and Columbia Basin areas and from newly irrigated lands in the Plymouth and Eureka areas. Fieldmen from the two sugar companies operating in the areas helped select fields for sampling and obtained cropping and fertilizer histories of the fields.

Fields that were well-fertilized with N and P were selected so that the need for micronutrients by the crop would be emphasized. Because of possible sample contamination, one of the fields sampled had received foliar-spray applications of nutrients, although some had one or more micronutrient fertilizers applied to the soil before planting. Some fields had received S applications for mildew control before sampling.

About 2-acre areas in each field were selected for sampling. The foliage samples consisted of 20 leaf blades and petioles in separate samples selected at random from the youngest, fully mature leaves. They were washed in distilled water, cut into small pieces, dried at 55 C under forced draft, and ground in a stainless steel Wiley mill to pass a 40-mesh screen. Acid-soluble P and S were determined on 2% acetic acid extracts of the dried plant material, using charcoal to obtain clear, colorless solutions. Total S was not determined because of possible sample contamination by elemental S used for mildew control. Acid-soluble S was determined turbidimetrically (10). Boron was determined on dry-ashed samples using the Azomethine-H reagent (12). Total P and the other elements were determined after wet ashing the plant material in a mixture of nitric and perchloric acids. The metal cations were determined by atomic absorption spectrophotometry. Both forms of P were determined colorimetrically (5).

The soil samples were taken from the same areas as the foliage samples and consisted of 20 1-inch diameter cores taken to a 12-inch depth. They were air-dried, ground to pass a 1 mm sieve, and analyzed for sodium-bicarbonate-soluble P (7) and K, and DTPA-extractable Cu, Fe, Mn, and Zn (6).

Besides the regular survey samples, one field was sampled at four different times during the growing season to determine how the nutrient concentrations in the leaf blades changed during the season. The youngest, fully mature leaf blades were sampled at each sampling date. This field was located near Kimberly, Idaho, and the crop yielded 21 tons/acre.

RESULTS

The nutrient concentrations in the leaf blades and the soil test values are given in Tables 1 and 2. The petiole samples also were analyzed but the data are not presented because better interpretive